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AUTHOR Lyness, Ann L.
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ABSTRACT

This study investigated whether an interactive video system of instruction taught cardiopulmonary resuscitation (CPR) as effectively as traditional instruction. Using standards of the American Heart Association, the study was designed with two randomized groups to be taught either by live instruction or by interactive video. Subjects were 100 students, primarily between ages 18 and 20, the majority of whom were nursing students. Both groups were taught theory and skills of basic life support including the components listed as: single rescuer (heartsaver), two rescuer, obstructed airway, and infant rescuer. Following instruction and practice, separate CPR evaluators tested individuals from either group without knowing the type of instruction they had received. For both the written test and the performance of heartsaver skills on the first attempt, there was no signficant difference between traditional CPR instruction and instruction by interactive video. Additionally, the interactive video system was superior in teaching the obstructed airway in basic life support. Fourteen references are listed. (Author/LMM)

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EFFECTIVENESS OF INTERACTIVE VIDEO TO TEACH CPR THEORY AND SKILLS

Ann L. Lyness
Director, Learning Resources Center
School of Nursing
University of Pittsburgh

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Abstract

This study sought to determine if an interactive video system of instruction taught CPR (cardiopulmonary resuscitation) as effectively as traditional instruction. Using standards of the American Heart Association, the study was designed with two randomized groups to be taught either by live instruction or by interactive video. Both groups were taught theory and skills of basic life support including single rescuer (heartsaver), two rescuer, obstructed airway and infant rescuer. Following instruction and practice, separate CPR evaluators tested individuals from either group without knowing the type of instruction they had received. For both the written test and the performance of heartsaver skills on the first attempt, there was no significant difference between traditional CPR instruction and instruction by interactive video. Additionally, the interactive video system taught obstructed airway in basic life support better.

EFFECTIVENESS OF INTERACTIVE VIDEO TO TEACH CPR THEORY AND SKILLS

This study was initiated in response to a request by the American Heart Association to validate if an interactive video system of CPR instruction taught as effectively as traditional instruction. The rationale for development of the interactive video system was based on the need for greater availability of CPR instruction. No matter how extensive campaigns have been to train instructors, approximately the same number of individuals enter as instructors each year as the number leaving. The demand for CPR courses has often been greater than their availability (Nelson and Brown, 1984). Chances against having a trained CPR rescuer in the United States have been 18 to 1 (Hon, 1982). To provide a supplemental means of instruction, a mediated format was sought with the aid of instructional technology. An effective system of instruction could be applied to round out public and professional needs for CPR instruction.

Background

The value of training large numbers of individuals in CPR skills is well established. Mortality statistics and their circumstances support large scale CPR instruction in populations. Annually, about 640,000 persons in the United States die from ischemic heart disease and approximately 350,000 of these occur outside hospitals (White, 1982).

The majority of cardiac arrests occur in the home (St. Louis, 1982) making evident a need for family members and others to have CPR background to draw upon in the event of an emergency. Even with effective community services, prompt CPR efforts by those at the scene could make a great difference in the condition of victims of arrest and unconsciousness.

Across the country, communities vary in their ability to handle emergencies and to instruct residents in CPR. Cost is always a factor and people have to be motivated to take time out of busy schedules to prepare for an emergency that they may never face. Professionals are in a position to identify and influence target groups about CPR instruction and to implement a practical plan. Sousa (1982) reported an organized approach used in the Connecticut school system. CPR and first aid instruction were incorporated into the working day of teachers and staff. Cost included the salaries for nurses who provided the instruction, salaries for substitute teachers so that the regular teachers could be released, and cost for materials. St. Louis (1982) reported another target group in Washington. Physicians were surveyed to determine their CPR recommendations for spouses of heart patients. Findings showed that only 40% of physicians interviewed recommended CPR instruction for spouses. Physician education, ease of access to instruction and being able to fit the instruction in with job schedules may be influencing factors.

With the need for readily available CPR instruction apparent over the years, a variety of self learning and media augmented strategies have been devised.

Strategies of Instruction

Research reports of CPR instruction have compared the effectiveness of teaching strategies on cognitive and skill performance and have also looked at retention of knowledge and skills over time. Safar et al. (1981) reported a study initiated in 1973 in which adolescents were taught CPR through live instruction, a self training system, repeated film viewing without manikin practice, and the self training system with film viewings. The self training system taught as effectively as live instruction and better than repetitive film viewing. The self training group was tested for skill performance at 3 and 12 months post instruction with a decline to 50% or less of students passing skills by 12 months. In another study (Gombeski, Effron, Ramirez and Moore, 1982) participants completed either an eight hour, 3 session course or a four hour single session course and were tested for cognitive and skill retention after one year. While skill performance was below certification level for both groups at one year, knowledge and skills were significantly higher in the longer trained group. Friesen and Stotts (1984) compared retention as a result of CPR instruction by lecture demonstration - return demonstration and a self learning method that included use of slides, audiotapes and programmed instruction workbooks.

By eight weeks post instruction, both groups demonstrated cognitive knowledge at a mastery level. Skills were below mastery in both groups.

Additional course descriptions using media have been reported in the literature. DeBaca (1983) described a CPR course offered to hospital employees that incorporated the use of slides and audiotape followed by live instructor demonstration and return demonstration. After a five month trial period, the course was evaluated favorably. Rehm (1983) reported the effective use of a videotape on CPR as part of instruction given to parents whose baby had been hospitalized. The abundance of strategies using media to teach CPR over the last decade and longer, suggests wide acceptance that mediated instruction particularly with a self learning/pacing component may help with existing needs for effective CPR instruction.

CPR Interactive Video

With recent technological advances, exploring how technology could further facilitate CPR instruction was a natural next step. In 1981, Hessinger reported a computer and video instructional system developed by David Hon of the American Heart Association and other specialists. The technical features combined a Sony LPD-1000 laser optical videodisc player, two monitors, a random access audio machine, an adapted Apple II computer and adult and infant Laerdal manikins wired with sensors to detect key CPR skills.

The videodisc was selected over videotape because of its rapid random access capability. Needed pictorial information could be displayed without delays that might interrupt the learner's concentration. Immediate feedback could be provided to reinforce pertinent information.

The audiotape device was engineered to avoid having to contain sound on the videodisc during freeze frames. The videodisc does not play or record sound unless the disc is running. When sound accompanies a still picture about 400 video frames are used up every 15 seconds. Because so many still pictures were needed for the large program, no disc space could be wasted. Hence a random access audio recorder was created (Hon, 1982). The CPR instructional design for the software included key elements of instruction that would be given in a live situation such as: (1) attention gaining measures, (2) orientation to the instructional setting, (3) definition of terms, (4) organization of presentation related to objectives, (5) practice opportunities, (6) redundancy strategies, (7) motivators and (8) evaluation components.

Theoretical Framework

Systems theory as described by Von Bertalanffy (1969) and Hazzard (1971) can serve as a basis for looking at CPR and CPR interactive video instruction. With the underlying assumption that man is an open system, man's openness can be facilitated through CPR techniques. The victim of cardiac arrest, for example, becomes unable to circulate (throughput) needed blood supply.

With stoppage of respirations, life sustaining oxygen rich air (input) cannot come into the system. Carbon dioxide cannot be exhaled (output) from the system. A rescuer (second system) provides behaviors (output) through compressions and ventilations etc. to assist the victim's system operation. Resumed breathing or appearance of a pulse in the victim would represent examples of feedback to the rescuer.

When learning via interactive video, the learner as an open system acts on the closed system of hardware and software rendering it open (A videodisc-based course, 1983). The learner's behaviors (output) with the turn on switch and light pen to activate the menu of topics, initiate the openness. In addition, just as rescuer acts on a victim's system, the learner-rescuer acts on an adult or infant manikin's system made possible by sensors and interrelated connecting parts. Feedback elicited through the sensors and presented visually on the monitors, or by sound or touch, permits the learner to determine if the objective to be learned has been attained. For example, when being instructed, if hand placement for compressions is correct, the information appears on the monitor and a specific tone is sounded. During CPR testing, these feedback clues are withdrawn to more closely simulate an actual rescue. After testing feedback is given.

Procedure

When the CPR interactive video prototype was completed, the American Heart Association requested a validation study to

be done and it was carried out at a middle atlantic baccalaureate school of nursing. The American Heart Association set forth these requirements: (1) Study population would have no prereading, had never been certified and had some basic education level, (2) instruction would run six hours maximum and might be given in two segments, and (3) instructors at the national office of the AHA would not be involved in evaluation. The evaluation requirements included these: (1) Evaluation to be given immediately after classes, (2) Evaluation to be conducted by three evaluators who were CPR instructors but who did not give the instruction, (3) Evaluation would be made of first efforts at performance, and (4) The final number certified on first performance would be recorded.

Method

The present study was designed to examine the learning outcomes from CPR interactive video instruction as they compared to outcomes from conventional instruction. The critical question was, could the interactive video system instruct as effectively as live instruction. In accord with American Heart Association standards, two comparison groups of students with fifty students in each group, were planned and implemented. Fifty students of similar educational background were to take the interactive video course singly or in groups of three. Another fifty were to have live instruction.

Separate evaluators who were to be CPR instructors but did not instruct this population, were to test students from either group without knowing their mode of instruction. The reason why it was important to look at first performance was to examine the effectiveness of instruction at the same point for both types of instruction. For individuals who had unsuccessful first attempts, additional assistance would be offered because rescue skills need to be mastered in order for a person to give effective help to a victim of an actual emergency.

A core team consisting of a project director (P.D.) and a research assistant (R.A.) worked cooperatively to obtain and schedule the sample populations, arrange for CPR instructors and evaluators, and provide places for instruction. The research assistant was a certified CPR instructor but did not give instruction or conduct testing during the study. The R.A. was present when students learned with interactive video and provided minimal assistance when needed to overcome a technical snag in the system. As an illustration, when a sensor did not work in the prototype manikin, the R.A. helped. This happened on a few occasions as when the temporary landmark notch sensor became unglued, the R.A. showed the correct location or when the finger sweep sensor did not work in the obstructed airway section, the sweep was observed. The P.D. managed research events with time lines, established data strategies for analysis and drafted a report for the American Heart Association.

The population samples in the study consisted of students, primarily in the young adult years between 18 and 20. There were less than a dozen learners between 20 and 50. Most of the learners were nursing students. The remainder were pharmacy students or other university students. Two CPR instructors taught in the live instruction situation and three evaluators tested students. The instructors and evaluators had been certified by the American Heart Association. Between September 1982 and April 1983, 48 participants received basic life support CPR instruction by interactive video and 51 by traditional teacher taught instruction.

Students were scheduled in such a way that the time for CPR instruction would not conflict with course related demands in their schedules. CPR was not scheduled during major test times such as during mid term or final examination periods. It was also not scheduled during the holiday periods such as Thanksgiving and Christmas when many students would be away. Individual changes in scheduling had to be made from time to time due to illness or other reasons. When students cancelled appointments, they were rescheduled. In the live instruction situation, not all students were able to return for the second session at the same time. Seven students who took the first session did not return for a second session. There were seven live instruction situations given. Each of these consisted of two sessions roughly a week apart and testing was conducted immediately after the second session. The average class size was 6.43 students for each instructor with a range from six to eight.

For the interactive video system, students were scheduled individually and in small groups. Not all students were able to return for the second session and had to be re-scheduled. Some students who completed the heart saver segment singly, were scheduled at their request with a group to complete the other components of basic life support because the time agreed with their individual schedules. There were times when the system malfunctioned and although it was serviced promptly students had to be rescheduled.

Of the forty eight students who completed CPR instruction on the system, approximately four fifths finished as part of a group of two or three students. An additional two did not return after the first instruction. Students on the system finished instruction at different times singly, in pairs or in groups of three. Arrangements were made for testing when approximately six students were ready to be evaluated. The space of days between learning and testing differed for students with an average time of 5.60 days between completing CPR instruction and being evaluated.

Results

For skills, using a 2 tail test with an alpha error equal to .05, the null hypothesis for each of these tests may be stated as follows: There is no significant difference between the proportion of individuals from the interactive video group and the proportion of individuals from the traditional group who passed the test.

Tests were done to determine if skill level differences existed for heartsaver, which emphasizes a single rescuer, and for basic life support which consists of skills required for single rescuer, two rescuer, obstructed airway and skills to be performed on an infant. These were followed by testing individual skill components of BLS. The statistical results beginning with heartsaver are shown in Table 1.

Table 1

Z Test for Basic Life Support Components

COMPONENT	INTERACTIVE VIDEO (N=48) % PASSED	% FAILED	TRADITIONAL (N=51) % PASSED	% FAILED	Z
Single Rescuer (Heartsaver)	60.42	39.58	41.18	58.82	1.95
Two Rescuer	68.75	31.25	57.78	42.22	1.14
Obstructed Airway (Conscious)	87.23	12.77	71.11	28.89	2.04*
Obstructed Airway (Becomes Unconscious)	86.96	13.04	53.33	46.67	3.96*
Obstructed Airway (Found Unconscious)	81.25	18.75	51.11	48.89	3.35*
Infant	43.75	56.25	56.82	43.18	-1.32
Obstructed Airway (Infant Conscious)	70.21	29.79	79.55	20.45	1.54
Obstructed Airway (Infant Unconscious)	68.09	31.91	64.44	35.56	.39

* Significant at 1.96

Statistical tests were performed on individual skills within the basic life support instruction. Table 1 shows significant difference in situations of an obstructed airway of the conscious adult, becoming unconscious and when found unconscious. In these instances more skills were passed on first attempt by students who learned on the interactive video system. The rejection region for $\alpha = .05$ is $Z \geq 1.96$ or $Z \leq -1.96$. Using classical analysis, the hypothesis for heartsaver cannot be rejected and it must be concluded that there is no significant difference between students taught by the interactive video method and those taught be traditional instruction.

For basic life support, the hypothesis is rejected for an $\alpha = .05$ and it may be concluded that a significantly greater proportion of students taught by the interactive video method passed basic life support on the first testing than did students taught by traditional instruction.

In the knowledge section, all students completed a paper and pencil written examination. The same set of 50 multiple choice questions drawn from the American Heart Association questions were answered by both groups. Mean scores were as follows: For the interactive video group 84.35 and the traditional group 82.76, no sign. dif. at $\alpha = .05$ (sign test $z = 1.75$).

Based on theory and skill scores, it can be concluded that for both the written test and the performance of heartsaver skills on the first attempt, there was no significant difference between traditional CPR instruction and interactive video. Obstructed airway was taught better by interactive video.

Summary

This was a study to determine if interactive video could teach CPR as effectively as traditional instruction. Groups of randomly assigned individuals were taught using the two methods. Results showed that no significant difference existed between interactive video instruction and traditional instruction in both skills and knowledge with the exception of obstructed airway in the adult. The interactive video system taught skills for obstructed airway in the adult significantly better. The implication is that a technological means of instruction such as interactive video can be a valuable adjunct in helping to meet present demands for CPR courses. Future research is planned and will reflect this baseline research to validate the system. Variables such as learner differences, time and retention factors, cost factors as well as diverse content applications for interactive video need to be addressed further. In the present study it took approximately 6 to 8 hours for basic life support in both groups including certification. Discovering influencing variables related to time should be pursued. Retention studies need to focus on both cognitive and skill areas. Affective responses need also to be examined.

References

A videodisc-based course in cardiopulmonary resuscitation. (1983). Information Technology Newsletter. Harvard University, II (2), reprint.

DeBaca, V. (1983). CPR: One approach. The Journal of Continuing Education in Nursing, 14 (3), 23-24.

Friesen, L. and Stotts, N.A. (1984). Retention of basic cardiac life support content: The effect of two teaching methods. Journal of Nursing Education, 23 (5), 184-191.

Gombeski, W.R., Effron, D.M., Ramirez, A.G. and Moore, T.J. (1982). Impact on retention: Comparison of two CPR training programs. American Journal of Public Health, 72 (8), 849-852.

Hazzard, M.E. (1971). An overview of systems theory. Nursing Clinics of North America, 6 (3), 385-393.

Hessinger, L. (1981). Computer and videodisc: A new way to teach CPR. Biomedical Communications, 9 (5), 12-13.

Hon, D. (1982). Interactive training in cardiopulmonary resuscitation. Byte, 7 (6), 1-14. reprint.

Nelson, M. and Brown, C.G. (1984). CPR instruction: Modular versus lecture course. Annals of Emergency Medicine, 13, 69-72.

Rehm, R.S. (1983). Teaching cardiopulmonary resuscitation to parents. American Journal of Maternal Child Nursing, 8 (6), 411-414.

Safer, P. et al. (1981). Education research on life-supporting first aid (LSFA) and CPR self-training systems (STS). Critical Care Medicine, 9 (5), 403-404.

Sousa, B. (1982). School emergencies - preparation not panic, The Journal of School Health, 52 (7), 437-440.

St. Louis, P., Carter, W.B. and Eisenberg, M.S. (1982). Prescribing CPR: A survey of physicians. American Journal of Public Health, 72 (10), 1158-1160.

Von Bertalanffy, L. (1969). General system theory: Essays on its foundation and development. New York, Braziller.

White, R.D. (1982). CPR: basic life support. Clinical Symposia, 34 (6), 3-31.